



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 28, 2017

Mr. George A. Lippard, III
Vice President, Nuclear Operations
South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station
P.O. Box 88, Mail Code 800
Jenkinsville, SC 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNIT NO. 1 - RELIEF FROM THE
REQUIREMENTS OF THE ASME CODE REGARDING TURBINE DRIVEN
EMERGENCY FEEDWATER PUMP INSERVICE TESTING (RR-4-12)
(CAC NO. MF9503)

Dear Mr. Lippard:

By letter dated March 28, 2017, South Carolina Electric & Gas Company (SCE&G, the licensee) submitted an alternative to the requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code), associated with the turbine driven emergency feedwater pump inservice testing at Virgil C. Summer Nuclear Station (VCSNS) Unit 1.

The licensee submitted the proposed alternative pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Section 50.55a(z)(2) on the basis that the ASME OM Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the proposed alternative and concludes, as set forth in the enclosed safety evaluation, that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the NRC staff authorizes the use of alternative request RR-4-12 for VCSNS Unit 1 for the fourth 10-year IST program interval, which began on January 1, 2014, and is scheduled to end on December 21, 2023.

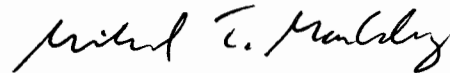
All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject request remain applicable.

G. Lippard

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If you have any questions, please contact the Project Manager, Shawn Williams, at 301-415-1009 or by e-mail at Shawn.Williams@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael T. Markley". The signature is written in a cursive style with a large initial "M".

Michael T. Markley, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-395

Enclosure:
Safety Evaluation

cc w/enclosure: Distribution via Listserv

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNIT NO. 1 - RELIEF FROM THE REQUIREMENTS OF THE ASME CODE REGARDING TURBINE DRIVEN EMERGENCY FEEDWATER PUMP INSERVICE TESTING (RR-4-12) (CAC NO. MF9503) DATED APRIL 28, 2017

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UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ALTERNATIVE REQUEST RR-4-12

FOURTH 10-YEAR INTERVAL INSERVICE TESTING PROGRAM

RENEWED FACILITY OPERATING LICENSE NO. NPF-12

SOUTH CAROLINA ELECTRIC & GAS COMPANY

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY

VIRGIL C. SUMMER NUCLEAR STATION, UNIT NO. 1

DOCKET NO. 50-395

1.0 INTRODUCTION

By letter dated March 28, 2017 (Agencywide Documents and Access Management System (ADAMS) Accession Number ML17088A256), South Carolina Electric & Gas Company (SCE&G, the licensee), submitted an alternative to the requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code), associated with pump inservice testing (IST) at Virgil C. Summer Nuclear Station (VCSNS) Unit 1.

Specifically, pursuant to 10 CFR 50.55a(z)(2), the licensee requested to use the proposed alternative on the basis that the ASME OM Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety.

2.0 REGULATORY EVALUATION

Paragraph 10 CFR 50.55a(f), states, in part, that IST of certain ASME Code Class 1, 2, and 3 pumps and valves be performed in accordance with the specified ASME OM Code and applicable addenda incorporated by reference in the regulations.

Paragraph 10 CFR 50.55a(z) states that alternatives to the requirements of paragraph (f) of 10 CFR 50.55a may be used, when authorized by the U.S. Nuclear Regulatory Commission (NRC), if the licensee demonstrates: (1) the proposed alternatives would provide an acceptable level of quality and safety or (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request and the Commission to authorize the alternatives requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 Components Affected

XPP0008, Turbine Driven Emergency Feedwater Pump (TDEFW)
TPP0008, Emergency Feedwater Pump Turbine

3.2 Duration of the Proposed Alternative

The proposed alternative is for the duration of the VCSNS, Unit 1, fourth 10-year IST program interval which began on January 1, 2014, and is scheduled to end on December 31, 2023.

3.3 Applicable ASME OM Code

The applicable ASME OM Code edition and addenda for the VCSNS Unit 1 fourth 10-year IST program interval is the 2004 Edition through the 2006 Addenda.

3.4 Proposed Alternative

The licensee requested an alternative to the testing requirements of the ASME OM Code.

ASME OM Code 2004, ISTB-3310, "Effect of Pump Replacement, Repair, and Maintenance on Reference Values", states:

When a reference value or set of values may have been affected by repair, replacement, or routine servicing of a pump, a new reference or set of values shall be determined in accordance with ISTB-3300, or the previous value reconfirmed by a comprehensive or Group A test run before declaring the pump operable. The Owner shall determine whether the requirements of ISTB-3100, to reestablish reference values, apply. Deviations between the previous and new set of reference values shall be evaluated, and verification that the new values represent acceptable pump operation shall be placed in the record of tests (see ISTB-9000).

The licensee has requested to use the proposed alternative described below for the TDEFW pump, XPP0008. The pump is ASME Code Class 3, and is classified as a Group B pump.

The licensee plans to install modifications and perform maintenance activities that will enhance the emergency feedwater system and improve the TDEFW pump head margin in April 2017 during Refueling Outage 23 (RF-23). The planned activities include:

Increase TDEFW pump speed from 4150 revolutions per minute (rpm) to 4500 rpm

Install automatic recirculation-flow control (ARC) valves in the motor driven emergency feedwater pump recirculation lines

Modify the TDEFW pump recirculation line due to the speed increase

Install flow limiting venturis in the common emergency feedwater lines to each steam generator

Disassemble and inspect the TDEFW pump

Because the TDEFW pump is being disassembled, the licensee is required to comply with the requirements of ISTB-3310. ISTB-3310 requires the establishment of new reference values or the reconfirmation of existing reference values following pump replacement, repair, or maintenance by the performance of a comprehensive pump test (for Group B pumps) before declaring the pump operable.

As an alternative to performing the comprehensive pump test on the TDEFW pump to determine pump operability, the licensee proposes to perform a Group B test as specified in Table ISTB-3000-1 in Mode 3 after the secondary steam supply pressure is greater than 865 pounds per square inch gauge (psig) and at the higher pump speed (4500 rpm). Vibration measurements will also be obtained in accordance with ISTB-3540. The licensee stated that modified system's addition of a second recirculation line will allow testing the pumps hydraulic capacity at a nominal flowrate of 290 gallons per minute (gpm). The licensee would compare the hydraulic data obtained to the data obtained prior to the outage, provided that a rotating assembly replacement is not required. The licensee noted that the TDEFW pump rotating assembly was last replaced in November 2000 and that historical IST results are essentially identical, indicating that no appreciable hydraulic degradation has occurred since that time.

The licensee stated the in addition to the testing described above, a comprehensive pump test will be performed per ISTB-5123, in Mode 1 at approximately 30 percent power or within 10 days of entering Mode 3. The licensee stated that if the plant will shutdown and cooldown below Mode 3 before completing the comprehensive pump test, the 10 day period will restart upon reentering Mode 3 ascending.

In its letter dated March 28, 2017, the licensee stated that a preservice test will be performed on the TDEFW pump in accordance with 10 CFR 50.65a(4) and ISTB-5110, "Preservice Testing" to:

1. Verify proper operation of the Terry Turbine lube oil system at the operating speed of 4500 rpm.
2. Collect flow rate and differential pressure (dP) data at a minimum of five points at the speed of 4500 rpm.
3. Record vibration data for the pump and driver at various flow rates to verify ASME OM Code overall vibration velocity caps are not exceeded at the operating speed of 4500 rpm.
4. Establish new reference values for dP and vibration at the comprehensive test flow rate of 670 gpm and the operating speed of 4500 rpm.
5. Establish new reference values for dP and vibration for Group B testing at the nominal flow rate of 290 gpm and operating speed of 4500 rpm for use on the modified recirculation lines.
6. Collect flow rate and dP data at five points for comparison to the vendor's pump curve and post rotating assembly inservice test data to quantify hydraulic head degradation.

3.5 Basis for Hardship

The licensee stated that during a previous comprehensive pump test while in Mode 3 during low decay heat conditions, they had difficulty establishing stable test conditions because of the decreasing steam generator pressures combined with excessive plant cooldown. The plant cooldown was caused by the high emergency feedwater flow rates that were required to establish the reference value within ± 20 percent of the pump design flow rate. The licensee noted that the cooldown also introduces a risk of an inadvertent safety injection. Based on the above, the licensee stated that complying with the requirements of ISTB-3310 would cause a hardship or unusual difficulty without a compensating increase in the level of quality or safety.

3.6 NRC Staff Evaluation

The TDEFW pump is classified as a Group B pump in accordance with the requirements in ISTB-1400 and ISTB-2000. Table ISTB-3400-1 requires that Group B pumps be tested quarterly and biennially. Requirements for the quarterly test are less rigorous than the requirements for the comprehensive pump test.

The licensee is performing modifications and maintenance on the TDEFW pump in RF-23. ISTB-3310 states that when a reference value or set of values may have been affected by repair, replacement, or routine servicing of a pump, a new reference value or set of values shall be determined in accordance with ISTB-3300, or the previous value reconfirmed by a comprehensive pump test (for a Group B pump) prior to declaring the pump operable.

The staff finds performing a comprehensive pump test in Mode 3 would be difficult due to the unusual difficulty to maintain stable test conditions during an excessive plant cooldown and decreasing steam generator pressures. Conducting a comprehensive pump test under the above conditions could also result in an inadvertent safety injection. Therefore, the NRC staff finds that performing the comprehensive pump test in Mode 3 would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety, thus meeting the requirements of 10 CFR 50.55a(z)(2).

The licensee proposed to perform a Group B test and to take vibration measurements (not a requirement for Group B test) in accordance with ISTB-354 in Mode 3 to determine TDEFW pump operability. The licensee will compare the flow and dP data to the pump curve generated from the preservice test to ensure that the pump is operationally ready.

The licensee stated the an ISTB-5123, comprehensive pump test, will be performed in Mode 1 at approximately 30 percent power or within 10 days of entering Mode 3. If the comprehensive pump test does not occur within this timeline, the ACTION statement of Technical Specification 3.7.1.2 shall apply:

- a. With one emergency feedwater pump inoperable, restore the required emergency feedwater pumps to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

Prior to entering RF-23, a preservice test will be performed in accordance with ISTB-5110. This test will generate a 5 point pump curve, and the points shall be from the pump minimum flow to at least the pump design flow, if practicable. This pump curve will be used to compare to the test data obtained from the post-maintenance Group B test, to ensure that the pump is

operating acceptably. The comprehensive pump test will be performed in Mode 1 at approximately 30 percent power, or within 10 days of entering Mode 3, provided the plant does not need to shutdown and cooldown below Mode 3 prior to completing the test. This test, which is more rigorous than the Group B test, will provide a data point further out on the pump curve and will provide further assurance that the TDEFW pump is operating acceptably.

Based on the above discussion, the NRC staff finds that the proposed alternative provides reasonable assurance that the TDEFW pump is operationally ready.

4.0 CONCLUSION

As set forth above, the NRC staff determined that alternative request RR-4-12 for VCSNS Unit 1, provides reasonable assurance that the TDEFW pump (XPP0008) is operationally ready. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the NRC staff authorizes the use of alternative request RR-4-12 for VCSNS Unit 1 for the fourth 10-year IST program interval, which began on January 1, 2014, and is scheduled to end on December 21, 2023.

All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject request remain applicable.

Principal Contributor: Robert Wolfgang, NRR